

What is claimed is:

1. A process for converting a biomass into a blending component for a petroleum-derived fuel comprising:

5 (a) extracting a lignin-containing fraction in a reaction medium from the biomass to provide a lignin feed material;

 (b) depolymerizing the lignin feed material in an aqueous solvent to provide a first composition comprising a depolymerized lignin; and

 (c) hydroprocessing the first composition to provide a second composition comprising an aromatic hydrocarbon, wherein the second composition provides a blending component for a petroleum or petroleum-derived fuel.

10 2. The process of claim 1 wherein the second composition is further defined as comprising alkylated aromatic hydrocarbons.

15 3. The process of claim 2 wherein the second composition is further defined as comprising monocyclic aromatic hydrocarbons.

4. The process of claim 1 wherein the blending component is further defined as having a blending octane number of about 110 or higher.

5. The process of claim 1 wherein the depolymerization is further defined as a base-catalyzed depolymerization.

20 6. The process of claim 2 or 3 wherein the aromatic hydrocarbons are further defined as comprising C₇ to C₁₀ alkylbenzenes.

7. The process of claim 1 wherein the biomass is a lignocellulose biomass.

8. The process of claim 1 wherein the second composition is further defined as comprising about 5% to 40% alkylated napthenes.

25 9. The process of claim 8 wherein the second composition comprises about 5% to 30% alkylated napthenes.

10. The process of claim 6 wherein the second composition is further defined as comprising from about 75% to about 95% C₇ to C₁₀ alkylbenzenes.

11. The process of claim 1 wherein the biomass is further defined as comprising from about 5% to about 70% lignin.

30 12. The process of claim 11 wherein the biomass comprises about 50% lignin.

13. The process of claim 1 or 12 wherein the biomass is further defined as comprising a Kraft lignin, organosolve lignin, a lignin derived from wood processing, a lignin as an ethanol process by-product, a lignin from a by-product of pulp and paper processing, or a combination thereof.

14. The process of claim 1 wherein the aqueous solvent comprises a dilute alkali hydroxide solution.

15. The process of claim 14 wherein the alkali hydroxide solution is about 0.5% to about 10 % wt of an alkali hydroxide.

16. The process of claim 15 wherein the alkali hydroxide solution is about 0.5% to about 3 % by wt NaOH.

17. The process of claim 1 wherein the depolymerization is carried out in the presence of a CsX-type zeolite as a superbase catalyst.

18. The process of claim 17 wherein the solid CsX-type zeolite superbase catalyst is used together with a 0.5% - 5% alkali hydroxide solution as a co-catalyst system.

19. The process of claim 5 wherein the base-catalyzed depolymerization is further defined as occurring at an operational temperature of from about 300° C to about 340°C.

20. The process of claim 19 wherein the base-catalyzed depolymerization operation temperature is from about 310° C to about 330°C.

21. The process of claim 5 wherein the lignin-containing feedstock material has a liquid hourly space velocity of from 0.5 h⁻¹ to about 10 h⁻¹.

22. The process of claim 21 wherein the liquid hourly space velocity is from about 2.0 h⁻¹ to about 9.0 h⁻¹.

23. The process of claim 1 wherein hydroprocessing of the first composition is further defined as hydrodeoxygenation and hydrocracking of the first composition.

24. The process of claim 23 wherein hydrodeoxygenation of the first composition is further defined as catalyzed by a MMo/γ-Al₂O₃ catalyst and hydrocracking of the first composition is further defined as catalyzed by a sulfided MMo/SiO₂-Al₂O₃-zeolite catalyst, wherein M is a Group VI to VIII transition metal promoter.

25. The process of claim 24 wherein the ratio of MMo/γ-Al₂O₃ catalyst : sulfided MMo/SiO₂-Al₂O₃-zeolite catalyst is from 1:1 to 9:1.

26. The process of claim 1 wherein the reaction medium is water.

27. The process of claim 1 wherein the hydroprocessing is further defined as comprising a hydrogen pressure of from about 500 psig to about 1800 psig.

28. The process of claim 27 wherein the hydrogen pressure is from about 500 psig to about 1000 psig.

5 29. The process of claim 1 wherein the hydroprocessing is further defined as comprising a reaction temperature of from about 360°C to about 390°C.

30. The process of claim 29 wherein the reaction temperature is from about 380°C to about 390°C.

31. The process of claim 24 wherein M is selected from the group consisting essentially of

10 Ru, Co, Re, Cr, Fe, Pt, and combinations thereof.

32. The process of claim 1 wherein the lignin feed material is depolymerized in the absence of alcohol.

33. A biomass-derived blending component for a petroleum or petroleum-derived fuel comprising about 70% to about 95% C₇ to C₁₀ alkylbenzene.

15 34. The biomass -derived blending component of claim 33 further defined as comprising about 5% to about 30% alkylated naphthenes.

35. The biomass-derived blending component of claim 33 further defined as comprising about 5% to about 10% alkylated naphthenes.

36. A method for enhancing the octane number of a petroleum or petroleum-derived fuel comprising:

20 combining the biomass derived blending component of claim 33 with a petroleum or petroleum-derived fuel at a ratio of about 1:10 to about 1:4 by volume to provide a blended fuel, wherein the octane level of the petroleum blended fuel is enhanced about 1% to about 30% over the octane level of the petroleum or petroleum-derived based fuel without the blending component.

37. The method of claim 36 wherein the octane level of the blended fuel is enhanced about 30% over

25 the petroleum or petroleum-derived fuel without the blending component.

38. The method of claim 36 wherein the petroleum or petroleum-derived fuel is gasoline.

39. A process for converting a biomass into a blending component comprising a monocyclic aromatic hydrocarbon-rich composition for petroleum-derived fuels comprising:

30 a) dispersing a lignin-containing feedstock material in an aqueous reaction medium to provide a dispersed lignin composition;

b) depolymerizing the dispersed lignin composition to provide a depolymerized lignin product; and

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c) hydroprocessing the depolymerized lignin product to produce a blending component comprising monocyclic aromatic hydrocarbons.

40. The process of claim 39 wherein the monocyclic aromatic hydrocarbon is further defined as comprising C₇ to C₁₀ alkylbenzenes.

5 41. The process of claim 39 wherein the blending component comprises a blending octane number of about 95-150.

42. The process of claim 39 wherein the blending component is further defined as having a blending octane number of about 110.

43. The process of claim 39 wherein the aqueous reaction medium is water.

10 44. A process for producing a BTX aromatic comprising:

- a) extracting lignin-containing material from a biomass;
- b) dispersing the lignin-containing material in a reaction medium;
- c) subjecting the dispersed lignin-containing material to an alkali hydroxide solvent to produce a first composition comprising a depolymerized lignin; and

15 d) hydroprocessing the first composition to provide a second composition comprising benzene, toluene, and xylenes, wherein the benzene, toluene, and xylenes are intermediates in the production of other organic chemicals.

45. A process for converting a biomass into a blending component for a petroleum-derived fuel comprising:

20 a) extracting lignin-containing material from the biomass;

- b) dispersing the lignin-containing material in a reaction medium;
- c) subjecting the dispersed lignin-containing material to an alkali hydroxide solution to produce a first composition comprising a depolymerized lignin;

25 d) hydrodeoxygenating and hydrocracking the first composition to produce a second composition comprising C₇ to C₁₀ alkylbenzenes, wherein the second composition provides a blending component for a petroleum or petroleum-derived fuel.

46. The process of claim 45 wherein the hydrodeoxygenating and hydrocracking of the first composition occur substantially simultaneously.

47. The process of claim 45 wherein the alkali hydroxide solution is about 1% to about 10 %

30 wt of an alkali hydroxide.

48. The process of claim 47 wherein the alkali hydroxide solution is about 1% to about 3% by wt NaOH.

49. The process of claim 47 wherein the reaction medium is water.

50. The process of claim 47 wherein the second composition is further defined as comprising
5 from about 75% to about 95% C₇ to C₁₀ alkylbenzenes.